Work-Related Musculoskeletal Injury Risk Assessment and its Relevance to Body Mass Index for Computer Professionals

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To find out the risk of musculoskeletal injury and its association with body mass index in computer professionals. This study was a correlational study design whereas two major variables such as REBA score and BMI were compared for possible association to find out the existing relationship one on another. After obtaining ethical clearance 142 Samples were screened and obtained consent to collect data for work related musculoskeletal injury risk by rapid entire body assessment (REBA) collected from medium and large-scale IT companies in Bangalore. There are 60 samples who have 4 and above REBA score were included in the study. Height and weight of the subjects were recorded and the body mass index (BMI) were calculated. A positive correlation existed between BMI and REBA scores and were significant. Results from current study suggest that body mass index influences the risk of developing work-related musculoskeletal injury for computer professionals.

Keywords: BMI; Computer Professionals; Ergonomics; REBA;
Work Related Musculoskeletal Disorder.

Musculoskeletal disorders affecting the soft tissues due to repetitive movements, vibrations, poor posture or physical load can damage the tendons, ligaments muscles and lead to Work related musculoskeletal disorders (WMSD). These are also termed as Ergonomic Disorders, Cumulative Trauma Disorders (CTD) and Repetitive Strain Injuries. WMSD develop gradually over a period of time and are most prevalent among the general working population

There exists a positive correlation between the incidence of work-related musculoskeletal disorder and working conditions due to bad postures, repeated movements, increased force, sedentary work, and vibrations without adequate rest and recovery. As per WHO and other researchers there are multifactorial etiologies for MSD which includes work intensification, stress and psychosocial factors[1].

Among all type of musculo-skeletal disorders the lower back pain is very commonly seen in information technology (IT) employees. The most common cause of disability in adults is pain in the low back which also results in loss of

workdays in the US[2,3,4]. There is an estimated loss of 149 million days of work per year which was further estimated to loss of about 200 million dollar loss annually and reduction in productivity[5,6].

Further, an increased use of computer has been associated with the development of Lower Back Pain(LBP). Specifically, for sedentary workers sitting in awkward positions frequently and working in a forward stooped posture has shown a likelihood of development LBP[7]. Many Studies also indicated that certain tasks performed while sitting in an ergonomically poor chair for long hours was also associated with low back pain (LBP)[8].

In many countries low back pain is a long term disability, were 90% of people suffering from it at some point or middle age in their lives[9,10]. The prevalence of LBP is high and this high incidence of low back problems leads to disability, sickness further leads to absence, early retirement[11] and lost working days[12].The risk of development of WMSD at workplace could be due to an increased demand at work that could affect physiological and psychological factors[13]

Research study shows there is a considerable association between the height and weight of an individual and musculoskeletal discomfort for computer users even in developed economic workstation[14]. Variability in physical structure and workstation arrangements are necessary to contribute between the forces acting on the human body which lead to musculoskeletal discomfort during work process. To determine one's obesity the body mass index is a frequently used and this is obtained by dividing body weight in kilograms by the square of body height in meters. The BMI is related to body composition and is highly correlated with body fat and which provides a better estimate of obesity than relative body weight. Body mass index values have been divided into five categories. They are underweight, normal weight, overweight, obesity, and extreme obesity[15]. Rapid entire body assessment is a observational method to analyze postural deviation in occupational setup. This tool helps ergonomist to find out the risk of developing musculoskeletal injuries In a workstation, it is found to be valid and reliable measure for risk assessment of computer professionals[16]. There was a need to find out whether body mass index

has any way influence musculoskeletal injury risk for computer professionals as this may help computer users look in to internal factors which may influence musculoskeletal disorder (MSD). This study may help industry to reduce sickness absenteeism and also reduce overall health care cost for employees. This study intended to find out the association between body mass index and Rapid Entire Body Assessment (REBA) score for computer professionals.

METHODOLOGY

Study Design

This study was a correlational study design aimed at finding the association between variables such as BMI and REBA score in computer professionals Sample size was determined as 60 by G*power 3.1 software with the minimum criteria of 4 in REBA score was mandated for every subjects to participate.

142 employees were screened who are working for large and medium scale IT industry in Bangalore, the subjects were evaluated by using REBA scale at their workstation, 60 samples were identified with REBA score 4 and above were included in the study. Age of the participants was 25 to 40 years old and had more than 3 years of experience in computer job working for 40 hours weekly. Out of 60 selected samples 22 were female and 38 were male. Subjects diagnosed with disc prolapse, recent surgery, any structural deformity, pathological spinal conditions, fibromyalgia are excluded from participation. Selected samples were assessed of their height and weight to calculate their BMI then screened with REBA scale for possible musculoskeletal injury risk in workplace. Based on the inclusion and exclusion criteria the subjects were selected for evaluation.

A total of 142subjects were screened out of which 60 samples (male and female) were qualified to be part of the study, their height and weight was measured to find out body mass index. REBA tool was used to evaluate the upper and lower parts of the musculoskeletal system for risks associate their job. A work sheet consisting of 13 steps was used to evaluate selected body posture, forceful exertions, type of movement or action, repetition, and coupling. Using REBA work sheet, the subject was assigned a score for each body part

including the wrist, forearms, elbows, shoulders, neck, trunk, back, legs and knees. The data from REBA and BMI was analyzed by using Pearson correlation coefficient by using statistical software Sigma Stat 4.0.

RESULTS

Pearson Correlation test was used to find out the association between body mass index and REBA score for 60 samples. The value of the mean and standard deviation of age, height, weight, BMI, REBA score is shown in table I. BMI and REBA score correlation shown in table II and was to be found statistically significant at p= 0.01. Graph I indicate the scatter diagram of body mass index and REBA score which has linear positive association.

DISCUSSION

WMSD is one of the reasons for work disability in computer professionals and which is quite common. Musculoskeletal pains are common amongst age group of 25-40 years and the prevalence was increased in computer professionals due to their target-based work, awkward posture, repetitive use of computers.

Work related musculoskeletal disorders are mostly observed in neck, shoulder and low back area. Life style changes associated with computer professionals are seen by increased use of computers and lack of physical activity and improper posture. People who spent a lot of time to use computers work related musculoskeletal pain is a common problem in people work with desktop, laptop, notebooks, computers and other terminal devices. Mean age of the participants were 30.88 and it shows the risk of developing injuries in early age with higher body mass index. Out of 60 participants 22 were female with the age range from 25 to 36 and in male out of 38 participants with the age range from 25 to 40 years. Height of the subjects were between 154 cm to 180 cm with the mean hight of 165.25cm and the weight range from 51 kg to 82 kg with the mean of 65.77kg. Higher the weight and shorter the height subjects were tent to develop abnormal posture in work station leading to development of musculoskeletal injury.

The repetitive movements at workplace performed by the computer professionals showed impact on their body mechanics and affect their health-related quality of life. These are mainly seen in people with static posture, long working hours

Table 1. Descriptive statistics of variables such as age, height,weight, BMI and REBA score

	N	Minimum	Maximum	Mean	Std. Deviation
Age	60	25	40	30.58	4.130
Height	60	154	180	165.25	6.796
Weight	60	51	82	65.77	6.690
Body mass index	60	19.0	30.0	24.133	2.4597
Reba score	60	4.0000	11.0000	6.866667	1.7894859
Valid N	60				

Table 2. Correlation between REBA score and BMI

Statistical Tool		REBA SCORE	BMI
Pearson Correlation	REBA SCORE	1.000	.404
BMI		.404	1.000
Sig. (2-tailed)	REBA SCORE	.	.001
BMI		.001	.
N	REBA SCORE	60	60
BMI		60	60

REBA VS BMI
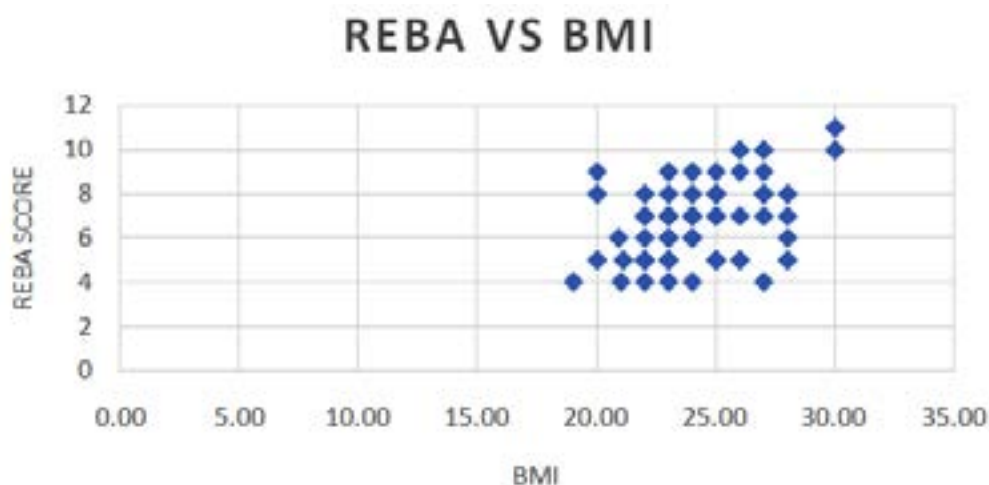
Graph 1. Scatter diagram –BMI & REBA score

and poor ergonomics at workplace. REBA is one mode of capturing poor posture that are often seen in computer professionals. The results of REBA provide a better understanding of the difference between many risk assessment methods and useful information for practitioners when choosing a method prior to an ergonomic intervention in computer professionals. The use of REBA for ergonomic evaluation in computer professionals give a better understanding of risk of developing musculoskeletal injury in computer professionals.

In a study, to find the association of BMI and musculoskeletal pain and related symptoms were analyzed with logistic regression. It was found that overweight participants were more likely to have musculoskeletal pain and related symptoms in the shoulder region[14]. In another study on the effect of body mass index on work related musculoskeletal discomfort and occupational stress of computer workers in a developed ergonomic setup. The study found that there was a significant effect of body mass index in increasing risk of work related musculoskeletal discomfort and occupational stress among computer professionals

A repetitive nature of computer-based task is associated with high prevalence of musculoskeletal disorders, particularly in the neck, upper and lower back and results in WMSD. More recent studies concluded that work related musculoskeletal disorders in the office environment should be considered not only in relation to physical

aspects of work place, but also in the psychosocial, organizational and individual factors[17].

Melek Ardahan et.al (2016) confirmed in a study that employees suffering with various musculoskeletal disorders who use computer for long hours. Sitting for longer duration especially awkward postures, use of wrong body mechanics during the working hours, poor knowledge on working atmosphere, poor dietary habits, life style modification, stress at work, shift work leads to work related musculoskeletal disorders[18].

In a study based on the results of ergonomic evaluation using rapid entire office strain assessment, an occupational gym program was designed and implemented. It was observed that the intervention of workers with the tasks and the adopted sitting posture at the computer throughout the day have effects at a muscular level, especially for the cervical area and shoulders[19]. The International association for the study of pain (IASP) estimated that chronic pain, including musculoskeletal affects about 20% of the adult population worldwide[20]. Neck pain, low back and shoulder pain are the major problems found in computer professionals. Physical and psychosocial factors can contribute to its development, as well as individual factors such as age, gender and anthropometry. The biomechanical load tolerance assumes that work related musculoskeletal disorders can occur due to imbalance between load and tolerance[21]. Research evidences shows body

mass index had significant association with risk of developing musculoskeletal injuries for work force from all domain including part time job and factory works of desktop job particularly back pain, shoulder pain and arm pain[22]

In this study the value of the mean and standard deviation of age, height, weight, body mass index, REBA score were calculated. Correlation coefficient was measured by pearson correlation test found 0.404, which means both BMI and REBA are positively corelated as higher BMI lead to higher risk of developing musculoskeletal injury in work place of computer professionals as body mass index and REBA score found significance at $p = 0.01$.

CONCLUSION

The results from our current study suggest that body mass index influences the risk of developing musculoskeletal disorder in computer professionals.

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